Remarks

Reconsideration of this Application is respectfully requested.

Upon entry of the foregoing amendment, claims 1-6, 14-17, and 22-24 are pending in the application, with claims 1, 5, 14, and 22-24 being the independent claims. Claims 7-13 and 18-21 have been withdrawn from consideration. Claims 1, 5, 14, and 22-24 are sought to be amended. These amendments are believed to introduce no new matter, and their entry is respectfully requested.

Based on the above amendment and the following remarks, Applicants respectfully request that the Examiner reconsider all outstanding objections and rejections and that they be withdrawn.

Objections to the Claims

The Examiner has objected to claims 1, 5, and 22-24 because of several informalities. Applicants respectfully submit that the amendments to claims 1, 5, and 22-24 obviate the Examiner's objection to these claims.

In particular, the Examiner objected to claims 1 and 22-24 because the feature "the latent semantic content" recited in the preamble of each claim lacked sufficient antecedent basis. By the foregoing amendments, the definite article (*i.e.*, "the") has been removed from the above-referenced feature in the preamble of each of claims 1 and 22-24. Accordingly, Applicants respectfully request that this objection to claims 1 and 22-24 be reconsidered and withdrawn.

The Examiner objected to claim 5 because the feature "the latent semantic indexed vector spaces" recited in line 14 lacked sufficient antecedent basis. By the foregoing amendments, the above-referenced feature now reads as follows: "the plurality

of latent semantic indexed vector spaces" (emphasis added). The antecedent basis for this amended feature is found in line 13 of claim 5. Accordingly, Applicants respectfully request that this objection to claim 5 be reconsidered and withdrawn.

The Examiner objected to claims 1, 5 and 22-24 because the feature "the number of occurrences" recited in the preamble of each claim lacked sufficient antecedent basis. By the foregoing amendments, the definite article (*i.e.*, "the") in the above-referenced limitation has been replaced with the indefinite article (*i.e.*, "a") in each of claims 1, 5 and 22-24. Accordingly, Applicants respectfully request that this objection to claims 1, 5 and 22-24 be reconsidered and withdrawn.

Rejections under 35 U.S.C. § 101

The Examiner has rejected claims 1-6, 14-17, and 22-24 under 35 U.S.C. § 101 as being directed to non-statutory subject matter. In particular, the Examiner has rejected these claims because "they appear to be directed to an abstract idea rather than tangible results." Although Applicants do not necessarily agree with the Examiner, claims 1, 5, 14, and 22-24 have been amended to expedite prosecution. Based on the foregoing amendments and the following comments, Applicants respectfully submit that claims 1-6, 14-17, and 22-24 are directed to statutory subject matter.

As currently amended, claim 1 recites a computer-based method for representing latent semantic content of a plurality of documents, wherein each document contains a plurality of terms. The method includes:

> deriving at least one n-tuple term from the plurality of terms;
> forming a two-dimensional matrix,
> each matrix column c corresponding to a document,
> each matrix row r corresponding to a term occurring in at least one document corresponding to a matrix column,

> each matrix element (r, c) related to a number of occurrences of the term corresponding to the row r in the document corresponding to column c,
> at least one matrix element related to the number of occurrences of the at least one n-tuple term occurring in the at least one document, and
> performing singular value decomposition and dimensionality reduction on the matrix to form a latent semantic indexed vector space and storing the latent semantic indexed vector space in an electronic form accessible to a user.

Applicants respectfully submit that claim 1 constitutes statutory subject matter because it recites something more than the mere performance of a mathematical algorithm in the abstract. Rather, it uses computer-implemented mathematical operations to produce "a useful, concrete and tangible result"—namely, "storing the latent semantic indexed vector space in an electronic form accessible to a user." As described in the specification of the present application, such a latent semantic indexed vector space, which includes a representation of at least one n-tuple term, can be used to, for example, represent and retrieve documents based on the semantic content of phrases. *See, e.g.*, the Specification at paragraph [0036].

Because claim 1 recites a process that uses mathematical algorithms to produce a useful, concrete and tangible result that does not preempt other uses of the mathematical principles, it constitutes statutory subject matter within the scope 35 U.S.C. § 101. *See AT&T Corp. v. Excel Communications, Inc.*, 172 F.3d 1352, 1358 (Fed. Cir. 1999) (claims drawn to a long-distance telephone billing process containing mathematical algorithms were held patentable subject matter because the process used the algorithm to produce a useful, concrete, tangible result without preempting other uses of the mathematical principle); *see also* MPEP § 2106 (IV)(B).

As currently amended, independent claims 5, 14, and 22-24 include features similar to the storing feature referenced above with respect to claim 1. Accordingly, Applicants respectfully submit that independent claims 5, 14, and 22-24 are also directed to statutory subject matter for at least the same reasons as set forth above with respect to claim 1.

Because dependent claims contain each and every feature of the independent claims from which they depend, the dependent claims are also directed to statutory subject matter. Accordingly, Applicants respectfully submit that claims 1-6, 14-17, and 22-24 are directed to statutory subject matter, and therefore request that the Examiner's rejection of these claims under 35 U.S.C. 101 be reconsidered and withdrawn.

Rejections under 35 U.S.C. § 112

The Examiner has rejected claims 1-6, 14-17, and 22-24 under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention. Based on the foregoing amendments and the following comments, Applicants respectfully traverse.

With respect to claim 1, the Examiner stated that he "sees neither connection nor functionality associated with placing the terms in n-tuple and between performing the SVD on a matrix of terms thereby rendering the claim to be indefinite." *See* the December 13, 2005 Office Action at page 4. Applicants respectfully disagree. As explicitly recited in the claim, n-tuple terms are related to SVD because (i) SVD is performed on a two-dimensional matrix "to form a latent semantic indexed vector space" and (ii) the two-dimensional matrix includes "at least one matrix element related to the number of occurrences of the at least one n-tuple term." The significance of these

features is explained in the specification. *See, e.g.*, the Specification at page 5, paragraph [0017]; page 5, paragraph [0017]; page 9, paragraph [0036]. For at least these reasons, Applicants respectfully submit that the features of claim 1 would be definite to a person skilled in the relevant art(s).

With respect to claim 1, the Examiner goes on to state that:

> [T]he recitation of "the latent semantic content" in the preamble does not set the functionality of creating a vector space as claimed in the last sentence of the claim. As the Examiner and one of ordinary skill in the art best introduce it, vector space is not always part of Latent Semantic indexing nor singular vector [sic] decomposition. The Claim language thus seem [sic] confusing and misleading.

The December 13, 2005 Office Action.

While Applicants agree with the Examiner that not all vector spaces involve Latent Semantic indexing or singular value decomposition, Applicants respectfully disagree with the Examiner's characterization of the claim language as "confusing and misleading." A person skilled in the relevant art(s) would readily understand that a latent semantic indexed vector space represents the latent semantic content of a plurality of documents. Furthermore, the teachings provided in the specification would facilitate such an understanding. *See, e.g.*, the Specification at page 5, paragraph [0017]; page 7, paragraph [0026]; page 10, paragraph [0036].

In sum, contrary to the Examiner's assertions, Applicants respectfully submit that claim 1 is *neither* "confusing and vague" *nor* "confusing and misleading" for at least the reasons set forth above. Claims 2-4 depend from claim 1. For at least the same reasons as set forth above with respect to claim 1, claims 2-4 are not deficient in the manner alleged by the Examiner. Accordingly, Applicants respectfully request that the

Examiner's rejection of claims 1-4 under 35 U.S.C. 112, second paragraph, be reconsidered and withdrawn.

With respect to claims 5 and 6, the Examiner's reasons for rejecting these claims under 35 U.S.C. 112, second paragraph, can be grouped into two categories. First, on page 4 of the December 13, 2005 Office Action, the Examiner asserts deficiencies in independent claim 5 and dependent claim 6 similar to those articulated with respect to independent claim 1 and dependent claims 2-4, respectively. For reasons set forth above, Applicants submit that claims 1-4 are not indefinite as asserted by the Examiner. For at least these same reasons, Applicants submit that claims 5 and 6 are also not indefinite in the manner asserts by the Examiner.

Second, on page 5 of the Office Action, the Examiner asserts that the recitations "a document" in line 6, "at least one document" in line 8, and "the document corresponding to c" in line 9 render claim 5 indefinite. Applicants submit that the amendments to claim 5 address these issues.

In sum, based on the reasons and amendments set forth above, Applicants respectfully submit that claims 5 and 6 are not indefinite. Accordingly, Applicants request that the Examiner's rejection of claims 5 and 6 under 35 U.S.C. 112, second paragraph, be reconsidered and withdrawn.

With respect to claims 16 and 17, the Examiner asserts that the recitation "generalized entity" in line 2 does not distinctly point out the invention rendering these claims indefinite. However, the term "generalized entity" is expressly defined in the Specification as "a semantic unit that is a short phrase of one or more stemmed words". *See* the Specification at page 12, paragraph [0049]. Based on at least this express

teaching, Applicants submit that the term "generalized entity" recited in claims 16 and 17 would be definite to a person skilled in the relevant art(s). Accordingly, Applicants respectfully request that the Examiner's rejection of claims 16 and 17 under 35 U.S.C. 112, second paragraph, be reconsidered and withdrawn.

Claim 14 has been rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential steps. Although Applicants do not necessarily agree with the Examiner, claim 14 has been amended to expedite prosecution. Accordingly, Applicants request that this rejection of claim 14 be reconsidered and withdrawn.

With respect to claims 22, 23, and 24, Applicants submit that these claims are not indefinite for at least the same reasons as set forth above with respect to claim 1. Accordingly, Applicants request that the Examiner's rejection of claims 22-24 under 35 U.S.C. 112, second paragraph, be reconsidered and withdrawn.

Rejections under 35 U.S.C. § 102

The Examiner has rejected claims 1-6 and 22-24 under 35 U.S.C. § 102(a) as being anticipated by Nello Cristianini, John Shawe-Taylor, Huma Lodhi, *Latent Semantic Kernels* (hereinafter "Cristianini *et al.*"). Based on the following comments, Applicants respectfully traverse.

Before issuing a rejection under 35 U.S.C. § 102(a) based on a reference, the examiner must determine the issue or publication date of the reference. MPEP 706.02(a).I. However, the Examiner has not established that Cristianini *et al.* is prior art against the instant application. The instant application was filed on December 5, 2001, and claims the benefit of U.S. Provisional Patent Application No. 60/251,423 filed on December 6, 2000. Based on information available to Applicants, Cristianini *et al.* was

published in March, 2002, in the *Journal of Intelligent Information Systems*, as evidenced by a print-out of an Internet web page attached hereto as Exhibit A. Additional information appears to indicate that Cristianini *et al.* may have presented their paper at The Eighteenth International Conference on Machine Learning held at Williams College in Massachusetts on June 28-July 1, 2001. In either case, however, Cristianini *et al.* was not published or presented before the earliest effective filing date of the instant application, and therefore does not qualify as prior art against the claims of the instant application.[1] Accordingly, Applicants respectfully request that the rejection of claims 1-6 and 22-24 as anticipated by Cristianini *et al.* be reconsidered and withdrawn.

The Examiner has rejected claims 14-17 under 35 U.S.C. 102(e) as being anticipated by U.S. Patent No. 6,678,679 B1 to Bradford (hereinafter "Bradford"). Based on the foregoing amendments and the following comments, Applicants respectfully traverse.

As currently amended, claim 14 recites a computer-based method for characterizing results of a query, including:

> automatically identifying n-tuples included in a collection of documents based on an analysis of the collection of documents, wherein each document in the collection of documents contains a plurality of terms;
> forming a latent semantic indexed vector space based on (i) the documents in the collection of documents, (ii) the plurality of terms, and (iii) the automatically identified n-tuples;
> querying the latent semantic indexed vector space with a query having at least one term;
> ranking results of the querying step as a function of at least a frequency of occurrence of the at least one term, thereby generating a characterization of the results; and

[1] If the Examiner has reason to believe that Cristianini *et al.* was published on an earlier date than March 2002 or was presented on an earlier date than June 28, 2001, Applicants respectfully request that the Examiner provide the basis for such belief.

storing the characterization in an electronic form accessible to a user.

Bradford does not teach or suggest each and every feature of claim 14. For example, Bradford fails to teach "automatically identifying n-tuples included in a collection of documents based on an analysis of the collection of documents, wherein each document in the collection of documents contains a plurality of terms," as recited in claim 14. In fact, Bradford is conspicuously silent on the issue of n-tuples, let alone "automatically identifying n-tuples."

Since Bradford does not teach or suggest each and every feature of claim 14, this reference cannot anticipate this claim. Since claims 15-17 depend from claim 14 (and therefore contain each and every feature of claim 14), Bradford also cannot anticipate claims 15-17. Accordingly, Applicants respectfully request that the rejection of claims 14-17 as anticipated by Bradford be reconsidered and withdrawn.

Conclusion

All of the stated grounds of objection and rejection have been properly traversed, accommodated, or rendered moot. Applicants therefore respectfully request that the Examiner reconsider all presently outstanding objections and rejections and that they be withdrawn. Applicants believe that a full and complete reply has been made to the outstanding Office Action and, as such, the present application is in condition for allowance. If the Examiner believes, for any reason, that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at the number provided.

Prompt and favorable consideration of this Amendment and Reply is respectfully requested.

Respectfully submitted,

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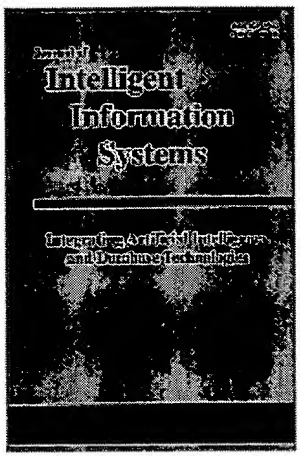

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Latent Semantic Kernels

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Abstract Kernel methods like support vector machines have successfully been used for text categorization. A standard choice of kernel function has been the inner product between the vector-space representation of two documents, in analogy with classical information retrieval (IR) approaches.
Latent semantic indexing (LSI) has been successfully used for IR purposes as a technique for capturing semantic relations between terms and inserting them into the similarity measure between two documents. One of its main drawbacks, in IR, is its computational cost.
In this paper we describe how the LSI approach can be implemented in a kernel-defined feature space.
We provide experimental results demonstrating that the approach can significantly improve performance, and that it does not impair it.

Kernel methods - latent semantic indexing - latent semantic kernels - Gram-Schmidt kernels - text categorization

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